Vegetation Resources Inventory

Ground Call (Ground Calibration) Data Collection Procedures and Standards

Prepared by
Ministry of Sustainable Resource Management
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For further information about the Resources Information Standards Committee, please access the RISC website at: http://srmwww.gov.bc.ca/risc/.

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1.0 Introduction

Vegetation Resources Inventory (VRI) ground calls are field assessments conducted by photo interpreters on both vegetated and non-vegetated land cover polygons. They are primarily intended to provide calibration information for subsequent photo interpretation by the individuals conducting the field visitations. Comprehensive land cover information is obtained through a detailed data-gathering routine. The data provide a useful link of land cover attributes to the polygons as observed under mid-scale aerial photography and thus, aid in providing accurate and consistent attribute estimation.

The process of ground call completion also becomes an iterative educational process as photo interpreters further their knowledge of the project area. Proper location and establishment of VRI ground calls provides useful data sources for any subsequent inventories.

2.0 Procedure

2.1 Principles

The following principles apply to the placement of Vegetation Resources Inventory ground calls.

1. The photo interpreter is rated primarily on the final polygon estimates provided. Ground calls will be audited to assess their correct establishment.
2. Ground calls are conducted in order to strengthen the final estimates.
3. Ideally, no more than 60 minutes of actual field time will be necessary to complete the ground call data collection.
4. There is to be minimal ground marking. Plot centres should consist of ribboned stakes firmly embedded in the ground. Trees are to be measured in a consistent manner (clockwise from north) and should be marked in such a way that they can be subsequently re-measured as part of an audit. Ribbon must be used to indicate the tie point and the direction of travel to the plot centre.
5. Before field visitation, the photo interpreter should observe the ground call polygon through stereoscopic vision and make preliminary estimates for all attributes. Following the data collection, the interpreter should review the initial estimates in comparison with the data obtained.
6. Before leaving the ground call, the photo interpreter must complete all measurements, calculations and data summaries. The photo interpreter should carefully consider the data summary as it relates to the ecology and vegetation of the site before leaving the polygon.
7. Tree count will be based on a diameter breast height (dbh) limit set by the field crew on the walk into the plot. This limit is based on standard utilization limit classes with the minimum limit being 4.0 cm, as; 1) trees smaller than this generally do not resolve very well on mid-scale aerial photographs; and 2) this minimum dbh is compatible with the Ground Sampling Phase of the VRI. The dbh classes therefore will be as follows: 4.0 cm, 7.5, 12.5, 17.5, 22.5 and 27.5. The dbh limit should be chosen based on the goal of sampling the dominant, co-dominant and high intermediate trees in the polygon and must remain constant for all plots in the ground call. If it is necessary to collect data in stands less than 4.0 cm, it is recommended that a fixed radius ground observation be used.
8. For multi-layer stands, compete information is to be collected and recorded for each layer visible on both the ground and aerial photograph. The field crew should stereoscopically view the polygon prior to collecting any data to determine whether multiple tree layers exist within the polygon. If there is more than one layer, the crews must write down next to the tree number which layer each tree belongs to.

The collection of ground call data should be distributed to cover the full range of anticipated land cover types to be observed. A tally should be kept for this purpose, and particularly complex cover types should be given emphasis for measurement. In this respect, initial polygon delineation for a project should be completed prior to the determination of field

calibration locations. Priorities for data collection may be identified on a project-by-project basis.

2.2 Field Work

Once all preliminary planning (polygon delineation, determination of potential ground call locations, access issues, permission acquired if entering private land/parks, all equipment assembled, etc.) has been completed, field data collection can begin.

2.2.1 Ground Call Types

There are three ground call types that are considered acceptable for the collection of ground data for calibration purposes: three point ground call, one point ground call and ground observations. All types of plots should be established in representative areas of the polygon. The types and amount of ground calls established will vary by project. It is expected that projects will use a combination of all types of calls. The lead proponent/licensee should consider the following factors when deciding on the proportions of each type of call: complexity of stands (uneven aged, multi species, variable heights, and variable density), age and distribution of previous data sources, and fieldwork budget.

Three Point Ground Call

The three point ground call consists of 3 plots with a minimum distance of 50 m between each plot. A reduction in the minimum distance is permitted in very small polygons. This type of ground call would typically be used in multi-species polygons, polygons with very patchy distribution, uneven-aged stands, etc. The three point ground call will provide better information on species composition, basal area, density, age, and height in these types of stands.

One Point Ground Call

The one point ground call consists of one plot established in a representative portion of the polygon. This type of ground call would typically be used in very homogenous polygons with little variation in attributes. Fire origin stands of lodgepole pine or stands of coppice aspen are good examples of where a one point ground call should be used.

Ground Observations

Ground observations with and without measurements can be an integral and highly useful source of data for the photo interpreter. Efforts should be made to collect and record data while traveling between formal ground call locations. All ground observation information can be collected on existing vegetation inventory field data collection forms.

2.2.2 Ground Call Measurements

- A fixed or variable radius plot is established. For fixed radius plots, the minimum plot radius is 3.99 m.
- Tree measurement and recording of data should be systematic in nature (clockwise from north); at a minimum, the first tree measured in each plot should

be numbered, and all trees tallied 'in' should be marked with a paint dot at or near dbh.

- Borderline trees will have the diameter and horizontal distance measured to determine whether they are 'in' or 'out'. This data should be recorded on the field cards.
- At least one sample tree, for age and height measurements, must be selected for both the leading species and second species (if more than one species present). If using a three point ground call, three leading species trees and one second species tree must be selected over the three plots.
- If there are no representative 'in' trees available, sample trees from outside the plot may be used. A comment should be noted on the field card indicating the approximate bearing and distance from the plot centre to the sample tree to aid in relocation.
- All representative sample trees are to have an 'S' painted on them facing the direction that the height was taken.
- The same sample trees must be used for both age and height.
- When using more than one point, the age and height information is to be collected after all of the plots have been established, as species composition must be known to collect the ages and heights for the appropriate species.
- All plots must be a minimum of 30 metres from any distinct, defined polygon boundary to reduce the possibility of edge effect. Possible polygon boundaries include, but are not limited to, road rights-of-way, cut blocks, well sites, swamps and water features. A reduction in the minimum distance from a defined polygon boundary may be permitted in very small polygons.

2.2.3 Ground Observation Details

Ground Observations with Measurements

Ground observations with measurements are situations where minimal field data is collected for polygons to give the photo interpreter data on specific attributes that has been confirmed on the ground. The photo interpreter should view the photograph stereoscopically before entering the polygon to estimate the species composition. A brief walk-through of the polygon should be completed to confirm the species composition. The age and height of a representative tree from each of the first and second leading species should be measured and recorded.

Ground Observations without Measurements

Ground observations without measurements are situations where select polygon attributes are visually estimated without the collection of any ground data. Information for treed attributes is generally restricted to estimates of species composition and height. Ground observations without measurements are highly useful for visually estimating, differentiating or identifying non-treed attributes such as the height of shrubs (shrub tall as opposed to shrub low), graminoids from forbs or the type of non-vegetated feature.

2.3 Field Cards

Four field cards are provided for recording all ground call data.

The description of the field cards does not preclude the use of hand held or palmtop computers. If these alternative data collection procedures are used, the contractor is still responsible for submitting as a deliverable, in an acceptable format, a hard copy summary of the data collected in the ground call. If data is captured digitally, this information may also be requested as a deliverable.

2.3.1 VS Card – VRI Ground Call Summary

This card contains the overall ground call summary information and follows the format of the attribute information as entered on the VRI Attribute Form. For each ground call, only one 'VS' card needs to be completed.

Use only one Basal Area Factor (BAF) or fixed-radius plot size and one dbh limit for all the plots in a ground call.

The sampling crew is encouraged to correlate the presence of all vegetation species (trees, shrubs, and herbs) with soil types and their moisture and nutrient regimes. A soil description is not required but may assist in soil moisture and nutrient regime verification. The collection of the remaining ecological information on the ground is also optional; this information may be best estimated from the photograph. Identification of unique information more readily visible on the ground may be indicated on the field card.

Record shrub data from an ocular estimate of all major shrub species. The sampling crew should collect shrub data only where it is visible both on the ground and on the aerial photograph. This will aid in the final photo interpretation process. Data for the herb, bryoid and non-vegetated attributes should also be collected when it is not obscured under the vertical projection of any taller vegetation (it is visible on the photograph.)

It is emphasized that the land cover information recorded and summarized on all of the VRI ground call forms must be completed in the field before the photo interpreter leaves the ground call. This is to aid photo interpreters in making the best use of the data that they collect while they are still in the field.

2.3.2 VW Card – VRI Ground Call Work Space

This card contains a work space area for the statistical summary (species composition, basal area, density, age and height) and stand table factors (to assist in the tree density calculation.) Only one card is completed for each ground call. Data should be collected and summarized for trees in the dominant, co-dominant and high intermediate crown positions.

Diameter Limit

The dbh limit used in the ground call must be stated on the VW card.

Species Composition

Species composition is determined on the basis of basal area. Enter the total number of trees for each species in all of the variable radius plots. The relative percentage that each species makes up in the composition is determined by dividing the number of trees of the species of interest by the total number of trees of all species. For instance, four Douglas-fir trees out of eight total trees represent a Douglas-fir species composition of 50%.

For fixed-radius plots, compute the individual tree basal areas and use them in determining percent composition.

Age and Height

Transfer the age and height of the first and second (when present) species from Card VM, and average them where necessary.

Basal Area (m^2/ha)

For variable radius plots, the basal area is determined by dividing the total number of trees in the sample by the number of plots, and then by multiplying the result by the basal area factor.

For fixed-radius plots, first calculate the total plot basal area (summing up individual tree basal area in Card VM), divide this by the number of plots, and multiply the result by the per hectare factor (PHF) corresponding to the plot radius being used (see table of Card VI).

Density

Transfer the density from the calculation at the bottom of Card VM and average as necessary.

Snag Frequency

Collection of this data may be done in a number of ways including an ocular estimate of the frequency of snags, determination of the number of dead stems within a circular fixed-radius plot multiplied by the per hectare factor, or inclusion in the variable radius plot and multiplied by the appropriate stand table factor. The method used by the field crew should be confirmed with the Contract Representative.

2.3.3 VM Card – VRI Ground Call Measure Point

This card must be completed for each plot in the ground call.

Record tree data for each plot visited. Choose the BAF size (or fixed-radius plot size) so that approximately six to eight live 'in' trees per plot are included and recorded on the VM card. Use only one BAF size (or fixed-radius plot size) in each ground call. This will make the summary calculations simpler to complete.

Tree measurement and recording of data should be systematic in nature (clockwise from north); at a minimum, the first tree measured in each plot should be numbered, and all trees tallied 'in' should be marked with a paint dot at or near dbh. All sample trees must have their dbh accurately measured. The dbh limit used in the ground call must be stated on the field card.

Species Composition

For each tree measured, enter the appropriate tree species code as indicated in the VRI Photo Interpretation Procedures. If it is not possible to accurately determine the species, identification of the tree to the genus level will be acceptable.

Age and Height

If no suitable trees for age and height measurement are available at any plot, sample trees outside (but near) the plot may be substituted and their numbers (beginning with 99 and counting down) should be noted on the field card.

Comments should appear on the field card indicating why non-plot trees were selected, and a general description of the location of the sampled trees relative to the plot centre should be noted.

Density

For variable radius plots, total the individual tree stand table factors and multiply by the BAF size used. Stand table factors are entered by tree and totaled (at the bottom of the card) to allow for a density estimate.

For fixed-radius plots, multiply the tree count by the per hectare factor (PHF) for the plot radius used.

Average the densities obtained at each plot to produce a final estimate for the entire ground call.

Slope, Aspect and Elevation

The slope, aspect and elevation fields are optional for the field crew collecting the ground calibration data. The collection and recording of this data may be useful to the photo interpreter in that species occurrence ranges by elevation (both minimums and maximums) and aspect could be correlated from the collected data.

2.3.4 VI Card – VRI Ground Call Information Sheet

Included in this field card is a basal area by dbh cross reference table that is useful for the basal area summary of fixed-radius plots. The per-hectare factor for a number of common plot radii is shown for reference.

2.4 Transfer to the Photograph

For all ground calls or observations, the minimum documentation on the face of the aerial photograph should include the following:

- the ground call or observation location and number;
- year of field work; and
- summary information collected at the sample location.

Upon completion of the ground call or ground observation, the appropriate aerial photograph or orthophoto should be pin pricked, and the ground call identification details, including the collected tree-specific data, should be entered on the reverse (back) side of the photo.

These requirements may vary on a project-by-project basis.

Appendix 1: Standards and Ratings

The purpose of the ground call quality assurance and auditing process is to facilitate the payment of funds for contract administration purposes. Acceptance of the ground call data is not necessarily a reflection of the accuracy of the data as the data may be within the defined standard but still have a biased result.

Standards

Location:	Ground calls must be located within a representative portion of the polygon, and location must be properly marked on photo and ground.
Species Identification:	One error allowed in species identification.
Age:	The measured ages must be within ± 5% or 5 years, whichever is greater.
Height:	The measured heights must be within ± 5% or 0.5 m, whichever is greater.
Diameter Breast Height:	Dbh must be within ± 3%.
Tree Count:	Up to and including ±1 tree on a one point ground call; ±2 trees on a three point ground call. Missed or added trees are cumulative (1 missed tree and 1 added tree in a plot is a difference in tree count of 2).
Basal Area and Density:	Must be correct, based on the recorded dbh classes and the number of trees tallied.
Suitable Sample Trees:	Must be representative and of the correct species.

Rating

Location representative of polygon	2
Location on photo and ground	1
Tree count (based on all plots within the ground call)	5
Measured dbh (0.5 points deducted for each error to a maximum of 1)	1
Estimated dbh (0.5 points deducted for each error to a maximum of 2)	2
Suitable sample trees selected (1 point deducted for each unsuitable tree)	2
Species identification (based on all plots within the ground call)	5
Age (2.5 points deducted for each error to a maximum of 5)	5
Height (2.5 points deducted for each error to a maximum of 5)	5
Basal Area	1
Density	1

Accept/Reject Criteria

The minimum acceptable rating on any individual ground call is 75%. Any individual ground call not meeting this minimum standard will be rejected. Each category must have an overall rating of 75%, except for age and height which must be 85%, to be considered acceptable. Any category that does not achieve this minimum standard will be rejected for that category. The minimum acceptable standard for all ground calls audited is 85%. If the average score of all of the audited ground calls as determined from the summary form meets this minimum acceptance level, the individual ground call standard is achieved, and the category standard is achieved, the work is considered acceptable.

Vegetation Resources Inventory
Ground Call Point Rating Form

Project: _____ **Contractor**: _____

Number of Ground Calls Completed: _____ Number of Ground Calls Audited: _____

Ground Calibration Point No.	Photo Number	Rep. Location (2)	Loc. On Photo (1)	Tree Count (5)	Meas. Dbh (1)	Est. Dbh (2)	Suitable Sample Tree (2)	Species ID (5)	Age (5)	Height (5)	Basal Area (1)	Density (1)	Points Possible (30)
Total Points	Obtained												
Total Points	Possible												
Rating (%)													

_____ / _____ x 100 = Overall Rating _____ %

(Total Points Obtained) (Total Points Possible)

Interpreter:_____ Auditor:_____

Date:_____ Accept: _____

(Yes/No)

Accept/Reject Criteria

The minimum acceptable rating on any individual ground call is 75%. Any individual ground call not meeting this minimum percentage will be rejected. Eac 75%, except for age and height which must be 85%, to be considered acceptable. Any category that does not achieve this minimum standard will be rejected standard for all ground calls audited is 85%. If the average score of all of the audited air calibration points, as determined from the summary form, meets this ground call standard is achieved and the category standard is achieved, the work is considered acceptable.

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